

REMARKS

Claims 1, 3-7 and 9-14 are pending in the application. Applicant amends claims 1, 3-7 and 10, cancels claims 9, 11 and 12 and adds new claim 15. Support for the amendments and new claim can be found throughout the specification, claims and drawings as originally filed. Accordingly, no new matter is added. Applicant respectfully requests reconsideration and withdrawal of the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claims 6 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicant regards as the invention. This rejection is respectfully traversed. Notwithstanding Applicant's traverse and solely in the interest of clarification, Applicant amends claim 6. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

REJECTION UNDER 35 U.S.C. § 102

Claims 1, 3, 4, 7, 10, 13 and 14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kusunoki et al. (U.S. Pub. No. 2002-0066934). This rejection is respectfully traversed. Notwithstanding Applicant's traverse and solely in the interest of expediting prosecution, Applicant amends claim 1.

Amended claim 1 recites a semiconductor device comprising: a base including a semiconductor material; an insulating material provided in contact with the base; and an

electrode provided on the insulating material. The insulating material includes silicon, oxygen, hydrogen, and at least one element other than silicon, oxygen and hydrogen. The insulating material has a region where B/A is in a range of 1.6 to 10 where a concentration of the at least one element in the region is defined as A and a concentration of hydrogen in the region is defined as B.

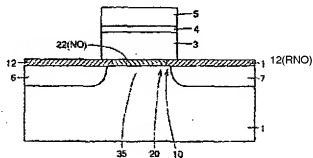
Thus, amended claim 1 now recites that the insulating material has a region where A and B satisfy the relation: B/A is in the range of 1.6 to 10. Support for this subject matter can be found at least in Ex. 9 of table 1 and at page 19, lines 1-2 of Applicant's specification as originally filed. More particularly, with regard to the claimed range of the B/A value, the lower limit value (that is, 1.6) is supported by the example of the present invention (See Ex. 9 of Table 1). As shown in Table 1, the B/A value of Ex. 9 at the portion residing at the thickness of Y/10 (Y is the average thickness of the gate insulating film) of the gate insulating film from the interface is 1.6. The upper limited value (that is, 10) is supported by the description of "A and B may satisfy the relation: B/A is 10 or less" (See line 1-2 of page 19 and original claim 1). Accordingly, no new matter is added.

For anticipation to be present under 35 U.S.C §102(b), there must be no difference between the claimed invention and the reference disclosure as viewed by one skilled in the field of the invention. Scripps Clinic & Res. Found. V. Genentech, Inc., 18 USPQ.2d 1001 (Fed. Cir. 1991). All of the limitations of the claim must be inherent or expressly disclosed and must be arranged as in the claim. Constant v. Advanced Micro-Devices, Inc., 7 USPQ.2d 1057 (Fed. Cir. 1988). Here, Kusunoki fails to disclose the limitation of B/A in the range of 1.6 to 10.

More particularly, it is possible to reduce an absolute quantity of Si-OH structures that reside in a gate insulating film made of the claimed insulating material when forming the gate insulating film and induce a dielectric breakdown of the insulating film by involving the at least one element other than silicon, oxygen and hydrogen (Hereinbelow, the at least one element is simply referred to as "the element X") in the insulating material (See lines 5-12 of page 16). In the claimed invention, it is possible to relatively reduce the amount of Si-OH structures that reside in the gate insulating film and to prevent the Si-OH structures from increasing due to an external electric field by satisfying the relation recited in claim 1 so that the resistance to the dielectric breakdown of the gate insulating film can be improved (See line 24 of page 16 to line 2 of page 17).

In contrast, Kusunoki et al. discloses a semiconductor device having a gate insulating film comprising RNO films (12) and a NO film (22) as shown in FIG. 1 below.

FIG 1



The RNO films (12) are nitride oxide films which contain silicon, oxygen, nitrogen at a content of $2.5 \times 10^{20}/\text{cm}^3$ or more, and hydrogen at a content less than $3 \times 10^{20}/\text{cm}^3$. The NO film (22) is a nitride oxide film which contains silicon, oxygen, nitrogen at a content of $2.5 \times 10^{20}/\text{cm}^3$ or more, and hydrogen at a content of $3 \times 10^{20}/\text{cm}^3$ or more.

When the concentration of nitrogen in each of the films (the RNO films (12) and the NO film (22)) is defined as A, and the concentration of hydrogen in each of the films is defined as B, the B/A value of each of the RNO films (12) is less than 1.2 as shown in the table below. The value of 1.2 has been obtained based on the following values of A and B.

	gate insulating film	
	NO film (22)	RNO film (12)
A	$2.5 \times 10^{20}/\text{cm}^3$ or more	$2.5 \times 10^{20}/\text{cm}^3$ or more
B	$3 \times 10^{20}/\text{cm}^3$ or more	less than $3 \times 10^{20}/\text{cm}^3$
B/A	not identified	Less than 1.2

Each of the RNO films (12) comprising the gate insulating film of Kusunoki et al, has a B/A value less than 1.2 while the gate insulating film (gate insulating material) of the claimed invention has a B/A value in the range of 1.6 to 10. Since each of the RNO films (12) comprising the gate insulating film of Kusunoki et al. has a different composition than the gate insulating film (insulating material) of the claimed invention, the gate insulating film of Kusunoki et al., necessarily having the RNO films (12), is submitted to be different from the gate insulating film (insulating material) of the claimed invention even if the NO film (22) has the same composition of the gate insulating film (insulating material) of the claimed invention.

Inasmuch as the Kusunoki fails to teach all of the claim limitations, Kusunoki cannot anticipate claim 1. Therefore, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 3, 4, 7, 10, and 13-14 depend from claim 1 and should be in condition for allowance for at least the same reasons as set forth above.

REJECTION UNDER 35 U.S.C. § 103

Claim 5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kusunoki et al. (U.S. Pub. No. 2002-0066934) in view of Hori et al. (U.S. Pat. No. 6,215,163). Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kusunoki et al. (U.S. Pub. No. 2002-0066934) in view of Mitani et al. (U.S. Pub. No. 2002-0140043). These rejections are respectfully traversed. Claims 5 and 6 depend from claim 1 and should be in condition for allowance for at least the same reasons as set forth above.

NEW CLAIMS

New claim 15 is added. Support for this new claim can be found throughout the specification, claims and drawings as originally filed. For example, please refer to original claim 1. Accordingly, no new matter is added. Applicant respectfully requests favorable consideration of this new claim.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office

Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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By: /Bryant E. Wade/
G. Gregory Schivley
Reg. No. 27,382
Bryant E. Wade
Reg. No. 40,344

HARNES, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

GGs/BEW/nrk